

# THE REVIEW

DEVOTED TO THE INTERESTS OF THE AMERICAN SOCIETY FOR METALS

Volume XI

DECEMBER, 1938

No. 10

## Development of Alloys Affected By Abrasives

Machining Hardest Alloys Made Possible by Modern Abrasives  
Wiswell Tells Golden Gate

By Clinton L. Dornbush

Golden Gate Chapter—Abrasives have had a very decided effect on the development of new alloys because they have made it possible to machine even the hardest alloy, according to P. S. Wiswell, Pacific coast manager of Norton Co. and Behr-Manning Corp., in his talk on "Abrasives, Their Influence on Industrial Development" at the October meeting.

Mr. Wiswell first presented a sound motion picture which showed the manufacture of abrasives from their mining to use in the various grinding processes.

The first artificial abrasive was silicon carbide, which is still used considerably. This was followed by fused aluminum oxide.

Bauxite, or aluminum oxide, is shipped from the mines in Arkansas to the electric furnaces near Niagara Falls for fusing and refining. Bauxite fuses at approximately 3700° F. During fusing, the impurities sink to the bottom of the furnace. The ingot is then allowed to cool to room temperature and the impurities removed. After crushing the ingot and washing, the abrasive is sized by screening, and water and air separation.

Holding equal importance with the abrasive is the bond. The five common types of bonds are: (1) Vitrified or ceramic clay, for brutal cutting, (2) silicate, for tool cutting, (3) shellac, a flexible bond for smooth finishing, (4) resinoid, for high speed grinding, (5)

(Continued on page 8)

## New Haven Learns Why Malleable Is Used for so Many Important Castings

By Don Sawtelle

New Haven Chapter opened the 1938-39 season on Oct. 13 with an interesting talk by Eugene Griest, general manager of the Fort Pitt Malleable Iron Co., on "Uses of Malleable Iron."

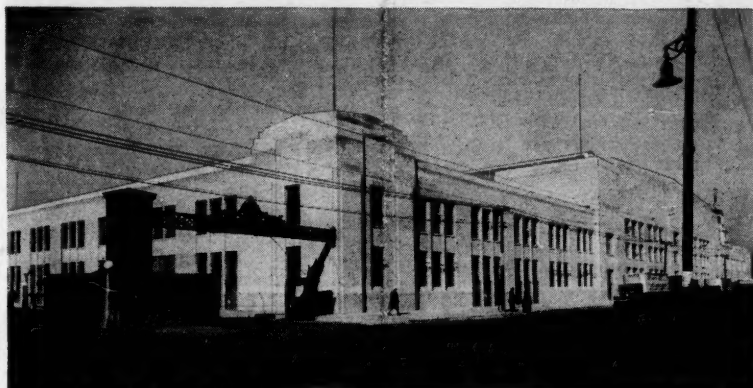
The program started in the afternoon with a plant visitation at the Malleable Iron Fittings Co. in Branford where members of the Chapter and guests were shown the actual steps in the manufacture and machining of both malleable iron and steel castings.

After the plant visitation there was the showing of a moving picture, "The Wheelabrator," by the American Foundry Equipment Co.

Following the dinner, Mr. Griest, in his talk, explained why malleable iron is being used today for so many important castings. A material which can easily be cast into intricate shapes and which stands first in machinability among the ferrous metals and high in shock resistance, can hardly be overlooked by the designing engineer.

Many present were surprised to learn of the total number of pounds of malleable iron castings on present-day automobiles, and the many vital points at which this versatile metal is used.

## '39 Congress to Be in Chicago Oct. 23-28



The International Amphitheatre Will House the National Metal Exposition Held in Conjunction with the National Metal Congress, to Be in Chicago the Week of Oct. 23 to 28. The Palmer House will be headquarters for the American Society for Metals during the week of the Congress.

## Aeration, Temperature, Velocity Are Three Factors in Corrosion Often Ignored

By J. Z. Briggs

New York Chapter held its first regular meeting of the new season on Nov. 14. The interesting coffee talk on social credit by Gorham Munson, general secretary of the American Social Credit Movement, led to a lively political argument.

J. B. Austin, U. S. Steel Corp., was technical chairman for F. L. LaQue's enlightening talk on corrosion. Mr. LaQue is assistant director of the Technical Service Department of the International Nickel Co., and is widely known for his work on corrosion.

Mr. LaQue first discussed the question of standardization of corrosion tests. It is neither possible nor desirable to use standardized tests for theoretical research, but is both advantageous and possible to have a code of recommended procedure for routine rate tests to avoid gross errors.

An examination of the corrosion literature shows that many important factors are often ignored. Three of the most important conditions that have had insufficient attention are: (a) Aeration, (b) temperature, (c) velocity.

The actual effect of variations in these factors may be quite complicated, since excess oxygen tends to protect some alloys by the formation of a protective coating, while changes in temperature may vary the amount of dissolved oxygen and the nature of the corrosion product. High velocities may wipe off the protective film, as is shown in condenser tube corrosion.

Most corrosion tests, however, should be tailor made to fit the circumstances. Although the corroding conditions are usually fixed, all factors should be controlled and should be mentioned in the report of the test.

Such tests as the salt spray test and the Strauss test are satisfactory for the use for which they were designed—to show up the porosity of coatings and the embrittlement of austenitic alloys respectively; however, the application of these tests to other problems or to determine general corrosion resistance can only be condemned unless enough experience has been accumulated to interpret the test results in terms of service results.

Often the simplest way to test the suitability of alloys for certain uses is

to subject the specimens to the actual corroding conditions. Mr. LaQue discussed a set-up designed to allow a comparative test of a number of different specimens under service conditions and advocated the adoption of some such standard.

Finally, it was suggested that all corrosion rates should be reported in a common unit; two of the most popular units are inches per year and milligrams per square decimeter per day. Of these two methods, the use of inches per year is perhaps to be preferred for reporting corrosion rates, since it is more understandable to the average engineer.

The ensuing discussion displayed the wide-spread current interest in this topic.



## Compliments

To A.S.M. Past-President William B. Coleman, consulting chemist and metallurgist, on his appointment as a new member of the Membership Committee of the Franklin Institute.

To John R. Townsend, materials standards engineer, Bell Telephone Laboratories, Inc., New York, on his election as a member of the Executive Committee of the American Society for Testing Materials.

To Frederic H. Emery, chemist, Harshaw Chemical Co., Cleveland, on his recent spectrographic detective work, in which his analysis of cement particles led to the conviction of two safe-blowers.

To David R. Howerton, REVIEW reporter of Chicago Chapter doings, metallurgical engineer, Western Electric Co., on his recent marriage to Mary Kaufman.

To U. S. Steel's E. S. Davenport and A. O. Smith's S. L. Hoyt on being selected to present the Campbell Memorial Lecture of the A.S.M. in 1939 and 1940 respectively.

## Trustees Agree To Purchase New Quarters

Decision to Buy Property for National Headquarters Taken at Board Meeting

Purchase of a permanent home for the national headquarters of the American Society for Metals was authorized by the Board of Trustees at a meeting held in Cleveland, Nov. 11. Details of this purchase, as well as other business transacted at the meeting are contained in the following minutes.

Present were W. P. Woodside, president; J. P. Gill, vice-president; Bradley Stoughton, treasurer; W. H. Eisenman, secretary; G. B. Waterhouse, past president; H. A. Anderson, D. S. Clark, F. B. Foley, and S. L. Hoyt, trustees.

First order of business was the appointment of new members to various national committees. Complete personnel of these committees, with new members and terms of service indicated, is listed on page 2.

Treasurer Stoughton presented a report of the meeting of the Finance Committee of the Society held Nov. 10. Those present were Bradley Stoughton, chairman; W. P. Woodside, G. B. Waterhouse, J. P. Gill, K. R. Van Horn, W. H. Eisenman, and C. W. Ohlson.

### Balance Sheet Studied

The first item considered by the Finance Committee was the balance sheet (published in December TRANSACTIONS). Each item was gone over carefully, and the following recommendations made to the Board of Trustees:

That the reserve for depreciation and obsolescence of book inventory should be increased from \$4,000 to \$6,000.

To increase the reserve for depreciation of investments from \$25,000 to \$30,000.

That the reserves for dues paid in advance should be increased from \$20,000 to \$35,000 (upon recommendation of the auditors).

That a Campbell Memorial Lecture fund of \$15,000 be set up to take care of this event.

That a fund of \$5,000 be set up to cover the Sauveur Achievement Award.

That the reserve for the permanent convention and exposition fund be increased from \$20,000 to \$50,000.

Upon recommendation of the Cleveland Trust Co., trustees of the funds of the A.S.M., it was moved to recommend to the Board of Trustees the sale of the Anaconda Copper Mining 4½ Bonds.

The next items considered were those of "income and expense general" which were combined with the budget.

The Finance Committee then reviewed the income and expense account of the Atlantic City Show, Western Show and Detroit Show and after consideration recommended them for approval and acceptance by the Board of Trustees.

The advertising accounts receivable were reviewed and found in satisfactory condition.

In a review of the investments Mr.

(Continued on page 4)



# THE REVIEW

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## Budd Engineer Gives Talk on Stainless in Railway Equipment

By G. E. Healy

Oregon Chapter—Prof. S. H. Graf, chairman of the Educational Committee, reported at the meeting on Oct. 7 that he had obtained data from Cleveland as to the educational courses available and recommended that the two courses on "Principles of Heat Treatment" by Grossmann and "Tool Steels" by Gill be considered for this year. The Secretary was instructed to send a questionnaire to all members to determine the number wishing to take the courses.

Norton Peck, chairman of the Program Committee, announced the subjects of the November and December meetings and congratulated A.S.M. members Harold E. Rose and Harold F. Wahl for having won prizes in the contest held by the Lincoln Arc Welding Foundation.

The speaker of the evening, Charles B. Conwell of the Edward G. Budd Co., gave a very interesting talk on the use of stainless steel in the construction of railway equipment.

He outlined the many different types of nickel-chromium alloys and told of the effect of adding such metals as selenium.

The stainless steel used by the Budd Company has an ultimate tensile strength of 150,000 psi. and a yield point of 105,000 to 120,000 psi. This steel is fairly easy to handle and its loss in corrosion resistance is very slight when worked.

The method of handling the steel was explained, particularly the "draw bench" they had developed. The methods of assembly at first presented quite a problem since the metal could not be riveted or welded by the ordinary methods because heating stainless steel above the critical temperature causes precipitation of carbide at the grain boundaries and the metal literally falls to pieces when subjected to corrosive conditions.

Mr. Conwell described the development of the Budd system of shotwelding in which there is control of time, current, and pressure. Welds so made form effective joints without the ill effects which characterize other welding processes.

Specimens of shotwelded stainless steel sheet and a series of slides showing the draw bench and the methods of assembly and welding were exhibited.

## Ford Uses Narrow Analysis Ranges for Heat Treated Steels

By A. W. Demmler

Pittsburgh Chapter—On Nov. 10, F. C. Young of the Ford Motor Co. presented an able discussion of automotive steels and their metallurgical problems.

The common analysis ranges of the S.A.E. classifications are narrowed down appreciably for specific parts; this applies not only to carbon but to all the other elements, and of course it calls for extreme care in the steel plant to meet such requirements. These close limits have been set up to simplify production heat treating.

Carbon-manganese and carbon-chromium steels constitute the major tonnage of steels in Ford cars; these cover axles, gears, springs, spindles and other parts.

Of course, there are the rustless steels for trim and incidentally in the interests of economy, 18-8 has been replaced to some extent by a chromium, lower nickel, higher manganese composition. A large salt spray room is maintained to check these materials.

In discussing the heat treatment of gears, control of the furnace atmosphere was considered as well as salt baths. The Ford Motor Co. has also investigated centrifugal casting of transmission and rear axle gears.

Induction hardening and flame hardening were considered; the former, a rather recent development, is receiving increasing attention. For this practice a fine-grained steel is required.

Still another new development was

## British Abstracts Bulletin Offered at Reduced Price

By agreement with the British Iron and Steel Institute the monthly *Bulletin of Abstracts* published by the Institute is now available to members of the A.S.M. at the specially reduced price of \$6.00, postage free, per annum.

The *Bulletin* constitutes a survey of current world literature on subjects of interest to iron and steel technologists and to those interested in ferrous metallurgy.

It is printed on one side of the paper only in order to facilitate filing, and is reprinted for permanent record every six months in the *Journal of the Iron and Steel Institute*.

Members of the A.S.M. who wish to obtain this publication should write for a free specimen copy. Inquiries, orders and remittances (the annual subscription is \$6, covering 12 monthly issues) should be addressed to the Secretary, The Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W. 1., England, and not to the offices of the A.S.M.

mentioned: Hot rolled (controlled cooling) bars have been cold drawn to the desired properties for drive shafts. In this way heat treatment and distortion are avoided and a product of absolute straightness is obtained.

Various shop tests of finished parts have been devised so as to insure satisfactory service.

The Pittsburgh Chapter thoroughly enjoyed a practical and worthwhile survey of automotive considerations.

## Appointments to National Committees Announced at Board of Trustees Meeting

At the meeting of the Board of Trustees held last month, new appointments to the various national committees of the Society were announced.

In order that the members may have a roster of the national committees as they are constituted at the present time, the complete personnel is listed below. The new appointments are shown in black face type and the numerals represent the date of expiration of membership.

### CONSTITUTION AND BY-LAWS COMMITTEE

E. G. Mahin, Notre Dame, Ind., chairman, '39  
K. J. Mackenzie, Endicott, N. Y., '39  
C. H. Shapiro, Houston, Texas, '40  
Bernard Collitt, Montreal, '40  
G. M. Rollason, Garwood, N. J., '41  
Harvey A. Anderson—representative of the Board of Trustees

### FINANCE COMMITTEE

Bradley Stoughton, Bethlehem, Pa., chairman  
K. R. Van Horn, Cleveland, '40  
Zay Jeffries, Cleveland, '41  
J. M. Schlendorf, Cleveland, '40  
G. H. Clamer, Philadelphia, '39

### PUBLICATION COMMITTEE

L. W. Kempf, Cleveland, chairman, '39  
R. T. Bayless, secretary  
John Chipman, Cambridge, Mass., '39  
Earnshaw Cook, Mahwah, N. J., '39  
V. N. Krivobok, Brackenridge, Pa., '39  
A. L. Boegehold, Detroit, '40  
W. H. Swanger, Washington, D. C., '40  
W. H. Bassett, Jr., Hastings-on-Hudson, N. Y., '40  
J. L. Burns, Chicago, '40  
R. H. Hobrock, Detroit, '40  
J. J. Kanter, Chicago, '41

M. Gensamer, Pittsburgh, '41  
B. L. McCarthy, Buffalo, '41  
M. J. R. Morris, Massillon, Ohio, '41

### EDUCATIONAL COMMITTEE

Reid L. Kenyon, Middletown, Ohio, chairman, '40  
Edgar C. Bain, Pittsburgh, '40  
Norman Mochel, Philadelphia, '40  
R. G. Roshong, Chicago, '39  
W. E. Harvey, Trenton, N. J., '39  
Horace Knerr, Philadelphia, '41  
William Conley, Rochester, N. Y., '41

### METALS HANDBOOK COMMITTEE

R. L. Dowdell, Minneapolis, chairman, '39  
J. Edward Donnellan, secretary  
R. H. Aborn, Kearny, N. J., '39  
K. R. Van Horn, Cleveland, '39  
R. B. Schenck, Flint, Mich., '39  
E. L. Bartholomew, Beverley, Mass., '40  
A. D. Beeken, Jr., Aliquippa, Pa., '40  
A. O. Schaefer, Philadelphia, '40  
S. C. Spalding, Waterbury, Conn., '41  
Jerome Strauss, A.I.M.E. representative  
H. L. Maxwell, A.W.S. representative  
John Howe Hall, A.S.T.M. representative  
C. W. Obert, I.A.A. representative

### METAL PROGRESS ADVISORY COMMITTEE

W. P. Woodside, president A.S.M.  
J. P. Gill, vice-president A.S.M.  
W. H. Eisenman, secretary A.S.M.  
R. T. Bayless, assistant secretary A.S.M.  
E. E. Thum, editor  
Zay Jeffries, Cleveland, '41  
T. C. Fetherston, New York, '39  
R. A. Wheeler, New York, '39  
D. K. Crampton, Waterbury, Conn., '39  
R. S. Archer, Chicago, '40  
C. Y. Clayton, Rolla, Mo., '40  
Gordon Williams, Cleveland, '41

## Columbus Has Two Meetings In November

Ellis Speaks on Forgeability;  
Bain Comes for Alma Mater  
Homecoming

By R. E. Christin

Columbus Chapter held two meetings during November, the regular monthly meeting on the 8th, and a special meeting on the 18th, the eve of the big Ohio State Homecoming football game with University of Michigan.

The regular meeting held at Battelle Memorial Institute was addressed by O. W. Ellis, Ontario Research Foundation, Toronto, Ontario. The subject, "Forgeability of Steels and Other Alloys" was illustrated and included the results of an investigation of single blow and repeated blow tests on steel, copper, and lead, with a formula to show the ratio of amount of reduction and weight of blow.

### Record Crowd Attends

As a special feature for those who planned to see the Homecoming game in Columbus, and especially to induce our good friend and former national president, as well as alumnus of Ohio State, Dr. E. C. Bain (Ed to most of us), assistant to the vice-president, U. S. Steel Corp., a meeting was called for the 18th. The largest crowd in the history of the Columbus Chapter, about 450 members and guests, assembled in the Social Administration Building on the Ohio State University Campus.

The meeting was opened with that very interesting and enlightening technicolor film, "Steel—Man's Servant", obtained through the courtesy of the American Steel and Wire Co., U. S. Steel subsidiary.

### Bain Gives Hardenability Lecture

After the film, Chairman Stein introduced Dean C. E. MacQuigg of the Department of Engineering as technical chairman to introduce Dr. Bain's talk on "Hardenability."

In view of his close association with Ed Bain at Union Carbide, Dean MacQuigg praised his knowledge and ability to make deductions of practical value.

One never tires listening to Bain's discourses on his favorite subjects, and the one delivered in Columbus was far from being an exception. We in Columbus are proud to give tribute to one who must be listed with the names of Campbell, Sauveur and the rest of our most noted metallurgical geniuses.

Since the talk of Dr. Bain in Columbus is to be published by the A.S.M., no summary is given here, lest we do not do justice to so fine a discourse.

The Engineering Department and the Chemical Department, headed by J. E. Withrow, Bain's former professor, joined the local chapter at this special meeting.

## Allegheny-Ludlum Visited

By Constance B. Brodie

Schenectady Chapter—The November meeting held on Nov. 15 took the form of a plant tour of the Allegheny-Ludlum Steel Corp., Watervliet, N. Y., followed by dinner and a talk at the Wolfert's Roost Country Club, Albany.

At the plant were shown all the operations in the production of alloy steel and a display of Ludlum. W. H. Norris, superintendent, Watervliet Plant, was the speaker of the evening. He described in detail the operations that had been witnessed in the afternoon.

## Air-Minded Rhode Islanders Are Reassured

Fischbeck Shows New Improvements and Inspection Methods Lower Engine Failure Hazard

By Walter M. Saunders, Jr.

Rhode Island Chapter became air minded on the evening of Nov. 2 when H. J. Fischbeck, chief metallurgist of Pratt & Whitney Aircraft Div., Hartford, Conn., gave a most interesting talk on "Metallurgical Problems in the Construction of Aircraft Engines."

After hearing of the improvements made, the countless high strength alloys used, and the rigid inspection requirements, even the most ardent admirers of terra firma would admit that the hazard of engine failure in airplanes is not very probable now.

It has been a long road from the first engine of the Wright Brothers, but the distance has been traversed in a short time, as judged by the highly developed mechanism of the present-day engine. Horsepowers have increased from the 30 of the Wright Brothers four-cylinder, water-cooled engine to 1000 in the present radial, air-cooled engine.

### Engine Is 48.5% Steel

High strength, low weight alloys have contributed to this development, and while the layman would consider aluminum light, it has been found that for some parts, steel heat treated to 160,000 psi. is lighter according to the strength-weight ratio. In fact, in one of the Pratt & Whitney Aircraft models, steel accounts for 48.5% of the material, the remainder being 45% aluminum, 2% magnesium, and 4.5% copper and brass. Included in the steel figure is a small amount of cast iron used in piston rings.

Coincident with changes in alloy materials have been improvements in using them. Chromium-nickel-molybdenum steels are readily machined at 400 Brinell. Magnaflux inspection of valve springs has practically eliminated spring failures. Heat treatment has made possible the use of many alloys previously considered out of the question, and nitriding of cylinder barrels for wear resistance is now common practice.

The combination of gears for compactness makes an interesting study and the problem of proper lubrication of moving parts is a challenge to the ingenuity of the mechanical engineer.

### Movie Illustrates Design

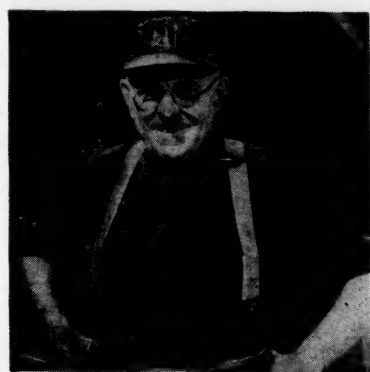
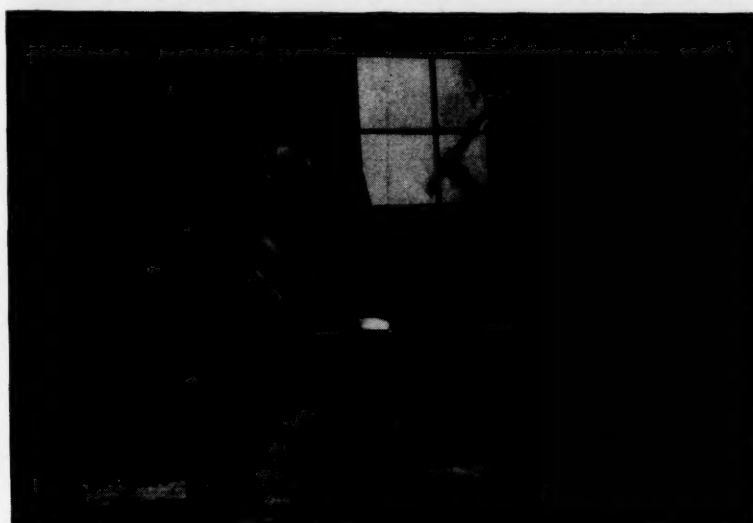
As an illustration of how the modern airplane engine works, Mr. Fischbeck presented a fascinating moving picture of such an engine in operation. Photography in color added to the attractiveness, and the cut-away engine, run at slow speed, showed what happens in various locations in the engine. This demonstration was most striking and is a valuable picturization of the ingenuity of the airplane designer.

In answer to a discussion period question, Mr. Fischbeck stated that there is quite a movement to stress the advantages of super-finishes. An extremely smooth working surface on mating parts tend to increase the life of the parts since the very slight grinding ridges left by the grinding wheels are removed, giving a large area of bearing contact.

Further questions had to do with lubrication and protection of sections of parts in nitriding by tin plating.

Mr. Fischbeck said that gears are

## Woodside Attains Stardom in New Movie



A.S.M. President Bill Woodside convincingly portrays a blacksmith in an old-time forge shop in these stills from the sound film "A Panorama of Alloys in Steel" produced by Climax Molybdenum Co., New York. This picture presents the history of alloy steel from the 90's up to the present. Many A.S.M. members will have an opportunity to see it during the winter when Mr. Woodside presents it in the course of his visits to the various chapters.

## Selection of Tests Should Be Governed By Needs Involved

By R. L. Templin

Pittsburgh Chapter—A capacity audience listened to an old friend, Dr. H. F. Moore, professor of engineering materials at the University of Illinois, speak on "The Significance of the Results of the Mechanical Tests of Metals" at the meeting on Oct. 13.

The speaker reviewed the general considerations of the various mechanical tests for metals and emphasized the importance of proper interpretation of the results. The significance and limitations of static tensile, compressive, torsion and hardness test data, as affected by the apparatus used and the technique followed, were discussed individually.

A brief discussion of the various methods of fatigue and impact testing, and some of the factors involved, was followed by some general observations concerning fatigue fracture and methods of detecting incipient failure.

The behavior of metals and alloys when subjected to steady or repeated load under elevated and low temperatures, corrosion, and other service conditions was pointed out. Lack or presence of correlation among the different mechanical properties and with service performance data was also discussed.

Finally, it was suggested that the selection of any test or tests should be governed by the needs involved. The justification of certain tests depends on the scope of the problem.

In some instances the properties to be determined are primarily for design or plant control specifications, while other problems may cover the development of new alloys and new uses which may require a complete survey of mechanical properties.

A lively discussion of present-day problems as related to the significance of mechanical properties, led by R. L. Templin, chief engineer of tests, Aluminum Co. of America, closed a very informative meeting.

## Transportation, Cooking, Head List of Al Uses

Kempf Reveals Laboratory Development of Alloy of 85,000 T. S. Not Yet Released

By L. F. Herron

Cleveland Chapter greatly enjoyed a coffee talk by Dick Kroesen at the November meeting. Dick is president of the Cleveland Sports Goods Co., and his anecdotes and experiences in the world of sport, both professional and amateur, had the audience roaring.

After a few words and the inevitable humor by our genial secretary Bill Eisenman, Hugh Brown introduced the speaker of the evening, Louis W. Kempf, research metallurgist in charge, Cleveland Section, Aluminum Research Laboratories, whose talk was entitled "Light Metals."

Mr. Kempf opened his speech with some statistics on the relative production of ferrous and non-ferrous metals in contrast to their availability in the earth's crust. He pointed out that predictions are that ultimate consumption will depend on availability and that aluminum comprises some 31% of the earth's crust.

In the consumption of aluminum by industry transportation and cooking utensils lead the list. The properties of strength, formability, stability, conductivity, and cost explain the use of the metal by the industries.

### Alloying Effects Discussed

The increase in strength by alloying was explained in conjunction with the general alloy diagram. Alloying effects of magnesium silicide, magnesium and copper were discussed as well as heat treatment and work as related to strength and formability.

Mr. Kempf stated that alloys up to 85,000 psi. tensile strength had been developed in the laboratory, but were not released commercially as yet because of lack of formability.

Stability or corrosion resistance of pure aluminum is excellent because of the spontaneous formation under ordinary conditions of exposure of a tough, resistant surface film of aluminum oxide. The relative resistance to corrosion of aluminum alloys depends largely on the relative electrolytic potential differences between pure aluminum and the elements concerned.

Use of magnesium and its alloys was then taken up; 70% of the output is absorbed by the aircraft industry.

Mr. Kempf closed by showing some interesting slides which, as Hugh Brown pointed out, had only brunet models.

A turnout of about 300 members and guests gave the lie to the old adage that "A prophet is not without honor save in his own country."

## Bethlehem Movie Shown

By M. J. Donachie

Springfield Chapter convened for the second meeting of the current year at the Hotel Worthy, Oct. 24. The dinner was well attended and the meeting rooms filled to capacity for the evening's subject.

This was a motion picture "The Making of Alloy Steel" by the Bethlehem Steel Co., who had a metallurgist in attendance to answer all questions arising from the presentation.

The movie, which was of an excellent educational value, portrayed the many and important steps in the manufacture of alloy steels.

## Grossmann Gives Notre Dame Hardenability Talk

By George E. Stoll

Notre Dame Chapter was honored at the first meeting with the presence of Marcus A. Grossmann, director of research, Carnegie-Illinois Steel Corp.

The meeting was preceded by a well-attended dinner in the University of Notre Dame Dining Hall.

The technical session was held in the auditorium of the Engineering Building. Mr. White, the new chairman of the Chapter, introduced Dr. Grossmann to the audience.

The speaker, after a few introductory remarks, launched into a very interesting discussion on the "Hardenability of Steel" which was a résumé of a paper presented at the 1938 A.S.M. Convention. This was reviewed in a previous issue and will be published in full in TRANSACTIONS.



# Minutes of Board of Trustees Meeting Held Nov. 11

(Continued from page 1)

Heydt of the Cleveland Trust Co. was called and invited to give a review of three stocks in the A.S.M. portfolio: The Columbia Gas and Electric Corp. 5's, now selling at 94; the New England Gas and Electric 5's, selling at 59; the Indiana Service Corp. 5's, selling at 58.

It was felt by the experts at the Cleveland Trust Co., who were consulted by Mr. Heydt before appearing before the Board, that it would be inadvisable for the Society to make any sacrifice in principal in order to dispose of the above bonds at this time. The meeting then adjourned.

The Board of Trustees then reviewed the balance sheet, investment list, advertising accounts receivable, inventory, income and expense general, income and expense Detroit show, income and expense Atlantic City show, and reviewed the proposed budget submitted by the Finance Committee for the year 1938-39 (all published in the December issue of TRANSACTIONS).

The Board of Trustees accepted and placed in force the report of the Finance Committee.

## Property a Safe Investment

President Woodside then reported the Society had an opportunity to purchase a home near the present office as a permanent headquarters for the Society. The Board of Trustees had given this matter very serious consideration at previous meetings and had had a real estate expert, Edward Ostendorf (now president of the National Association of Real Estate Boards), make an independent appraisal of the property. This appraisal indicated the value of the corner lot (83 x 270 ft.) alone at \$42,500 and the present reproduction price of the 24-room, three-story stone home at \$125,000. The property was offered to the A.S.M. for \$45,000.

Furthermore, the Cleveland Trust

Co., trustees of the Society's investment fund, indicated to the Board of Trustees that the Society had at present no investment in real estate and that desirable real estate investments were difficult to find.

The Board of Trustees recognized the property as a safe investment for A.S.M. funds and in addition has the added advantages of making a most suitable and readily adaptable national headquarters for the Society, affording approximately three times the present space, thus providing for the collection and storage of the Society's property which at present is located in different places in the present building, in warehouses, and in the storerooms of the printer. The added space will make it possible to provide a conference room for out-of-town members, and outside of the conference room the building will be used exclusively as national headquarters.

The cost of maintaining the house, even after allowing 3½% charge for interest (present average income on investments) on the money invested in the property, will be only \$1000 per year in excess of the present rental costs of the A.S.M., which will be more than offset by the added facilities and provisions for future needs of the Society. The total cost of alterations necessary to make the quarters tenable for A.S.M.'s use will not exceed 5% of the purchase price.

The present owners will require at least a year (Jan. 1, 1940) before possession can be given.

While the property was not considered from the viewpoint of making money in real estate, nevertheless, the Board of Trustees and the investment counsel as well as the real estate appraiser felt that the property had every possibility of substantial increase in value.

Upon motion by Mr. Anderson, seconded by Dr. Clark and unanimously

carried, the following resolution was adopted:

"Resolved: that the President and the Secretary of the Society be authorized to negotiate in consultation with proper legal counsel the purchase for the A.S.M. of the designated property at a cost not in excess of \$45,000, the property to be used for national headquarters of the Society."

Upon presentation of the Secretary's report on change of dates of the 1939 Chicago Metal Congress and Exposition so as to avoid conflict with other expositions and conventions, there was a motion by Dr. Waterhouse, seconded by Mr. Foley and unanimously carried to change the dates for the 1939 congress and exposition at Chicago from the week of Oct. 16 to the week of Oct. 23.

The Secretary was instructed to select the Palmer Hotel, Chicago, as headquarters for the 1939 congress and exposition, and was authorized to extend invitations to the American Institute of Mining and Metallurgical Engineers, the Wire Association and the American Welding Society to co-operate in the 1939 National Metal Congress and Exposition.

## Educational Committee Minutes

The Secretary then presented the report of the meeting of the Educational Committee meeting held Nov. 1.

Present were R. L. Kenyon, chairman; E. C. Bain, E. B. Drake, W. H. Eisenman, W. E. Harvey, R. G. Roshong, and R. T. Bayless, secretary. N. L. Mochel, W. P. Woodside, and G. B. Waterhouse were absent.

First order of business was a preliminary discussion of the proposed series of lectures to be given at the next annual meeting of the Society to be held in Chicago, Oct. 1939, the author to be E. C. Bain and the subject matter being the effect of elements on transformations of steels with the tentative title of "Introduction to the Alloying Elements." Dr. Bain gave the following outline of what he proposed to include in the series of five lectures:

- LECTURE I—Nature of the Systems with Iron
- LECTURE II—Elements Dissolved in Austenite
- LECTURE III—Carbide Forming Elements
  - a. Restriction of Grain Growth
  - b. Red Hardness
  - c. High Creep Strength Materials of Low Alloy Content
  - d. Grain Control
- LECTURE IV—Design of Alloy Steels for Different Uses
  - a. Their Application
  - b. Combining Effects
- LECTURE V—Review of Principles Involved
  - a. Exemplification in Existing Alloys
  - b. What We Must Speedily Learn About These Factors (A Look Into The Future).

The Committee then turned its attention to an evaluation of the lecture series presented at the 1938 Detroit Convention.

It was agreed that both the afternoon series of five lectures on "Machining of Metals" and the series of three lectures on "Pyrometry" were exceptionally well done and met with complete approval.

Mr. Kenyon reported that the lectures on "Machining of Metals" had been put into book form and made available to the membership on Oct. 20, at a convention price of \$2.00 per copy with a subsequent sale price of \$2.50. This is a 177-page book with 132 figures.

The evening course on Pyrometry by Dr. Sosman will appear in book form later this year.

The fall-off in attendance at the fifth lecture in the Convention Series was discussed and it was felt that one of the reasons was the fact that the published book was placed on sale on Thursday afternoon. A second factor was believed to be the fact that since this lecture was scheduled as the last

technical activity of the Convention and since people were trying to crowd in all possible remaining time in the exhibition hall, they stayed away from the final lecture in order to gain that extra hour of time.

As a result of these two conclusions, it was recommended that next year the published book should not be made available for sale until the close of the final lecture on Friday. It was also recommended that the final lecture would be given Friday morning at 10:00 A.M. as a simultaneous session.

In further consideration of subjects for future convention lecture series, the consensus was that "Response of Metals to Stresses Set up by Various Loadings" might be the subject of a very satisfactory series of lectures. This series would exclude the use of mathematical formulas in presentation.

The Committee then turned to a consideration of visual educational activities.

The several members of the Committee had been studying various types of visual education including stereopticon slides, moving pictures, vocal films and vocal slides, and these were discussed. Messrs. Kenyon, Drake, Harvey and Roshong presented outlines of continuity for sound movies that had previously been assigned them by the Chairman.

After an extended discussion of methods of procedure and attack, it was agreed that the Committee did not feel they were in a position to recommend to the Board of Trustees a large expenditure of money for the production of a sound film by professional photographers, but that there are many people in the A.S.M. who have made a hobby of motion pictures and could be called upon to assist in the preparation of an educational film.

Several members of the Committee expressed their desire to assist in this work but in order to do so it would be necessary to have suitable photographic equipment.

## Photographic Equipment Authorized

As a result, it was resolved by the Committee "that it be recommended for the consideration of the Board of Trustees of the Society that the Committee be authorized to purchase a 16-mm. motion picture camera with suitable auxiliary equipment (\$500 to \$600 plus \$200 additional for film) for use by members of the Committee or at the direction of the Committee in the production of some educational movies that are under consideration."

The Committee agreed that an appeal should be carried in THE REVIEW for the services of members of the Society who are movie fans and either have camera shots or the possibility of shots in their plants that could be used in connection with some of the pictures under consideration.

With the proposed camera equipment available the Committee will probably proceed with R. L. Kenyon's script and scenario for the purpose of drawing into final form a tangible example of the Committee's ideas on visual education for presentation to the Board of Trustees.

It was agreed that the Secretary of the Society should draw up regulations on the use of the camera as regards its circulation among the various members of the Committee.

The meeting then adjourned.

The report of the Educational Committee was accepted with commendation, and an appropriation of \$700 was made for the purchase of the moving picture equipment and films.

It was reported that the Handbook

(Continued on page 5)

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This 300-page book covering many aspects of Hardenability should be on your reference shelf... especially since the pre-publication price to members is only \$1.50.

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## Flame Hardening Applicable to Variety Of Materials, Seemann Tells Ontario

By J. W. McBean

Ontario Chapter—The November meeting at Hamilton had a particularly interesting and timely talk on flame hardening by A. K. Seemann, engineer, Linde Air Products Co., New York.

This process is applicable to a wide variety of materials including steels of moderate carbon content, low alloy steels and even cast iron and malleable iron. The higher carbon steels are easily damaged by overheating and are more subject to checking than the medium carbon steels.

The process is especially useful in producing either a completely or a selectively hardened surface from  $\frac{1}{8}$  to  $\frac{1}{4}$  in. deep on a wide range of materials, allowing a great choice of core properties.

These properties can be developed first and will not be altered by subsequent flame hardening since heat pene-

tration is readily controlled by such factors as the heating time, distance of the torch-head from the work, and gas pressures. Rapid surface heating is made possible by the high temperature and concentrated heat of the oxy-acetylene flame.

Distortion is reduced to a minimum, since the surface is heated so quickly that the core is still cool and strong and therefore resists the pull of the surface.

This freedom from distortion may be utilized even in carburized work, for the pieces may be straightened after carburizing while still hot, and later flame hardened.

Another peculiarity of the method is that because of the rapid surface heating of large pieces the cold core assists in absorbing heat from the surface, and in some cases this may eliminate the necessity for a liquid quench.

The apparatus is portable and can

be used for parts which would be impossible to harden by furnace methods because of size or necessity for selective hardening.

The method is quick and economical for hardening the interior of cylinders or holes of comparatively small size, such as bearing surfaces. The heat is applied only where required and the torch is immediately available.

Hand methods may be used for building up worn surfaces and hardening after machining.

For uniform results in production work, however, it is advisable to have an accurately controlled heating time. A special form of torch-head is also desirable, and may have removable tips, which can be placed to conform with the outline of the work.

In the stationary method the torch-head heats the whole of the required surface without any motion of the head or work, and the heating is followed by a quench.

In the progressive method the torch-head is of the desired width and either the head or the work is traversed to secure the desired length. The quenching spray is supplied by the torch-head and is a short distance behind the flame.

The spinning method is applicable to shafts, rolls and small gears with fine teeth. The torch-head covers the length of the teeth or the heating area on a shaft while the work is rotated fast enough to secure a uniform heating of the annular path. While the work is still rotating, the torch is removed and the quenching spray applied.

As to cost, it is conservatively estimated that 1 cu. ft. of each gas will harden 4 sq. in. of surface.

## Hartford Sees Steel Movie

By D. J. O'Neil

Hartford Chapter at one of its biggest meetings enjoyed the splendid picture "Steel, Man's Servant," which was presented by the Carnegie-Illinois Steel Corp. There were 73 men at the dinner and 400 at the meeting, held in the Hartford Gas Co. auditorium.

A. H. d'Arcambal in his own inimitable way spoke briefly on the high spots of the metal show held in Detroit. Comments from the audience showed that d'Arc has not lost any of his appeal as a speaker.

The picture followed a short introduction by Chairman Hewitt and Technical Chairman Henry Moore. Henry proved his "metal" as a technical chairman. Richard W. Simon, assistant in the metallurgical department at Carnegie-Illinois Steel Co., Pittsburgh, did a fine job answering the questions from the floor.

## "Steel, Man's Servant" Shown

By Gilbert Soler

Canton-Massillon Chapter—The opening meeting on Nov. 17 was attended by over 100 members.

Following dinner, served at Hotel Onesto, a very interesting and humorous coffee talk was given by Sherlock Evans of Massillon, Ohio.

The technical program was featured by the United States Steel Corp.'s motion picture, "Steel—Man's Servant," which has been reviewed at length in a previous issue.

## Austempering Is Described in Detail At Syracuse Chapter

By W. G. Slack

Syracuse Chapter—On Tuesday, Oct. 11, E. E. Legge of the American Steel & Wire Co., Worcester, Mass., addressed the local Chapter on "Austempering." Mr. Legge has been in charge of the development of a commercial unit for this process which he described in detail.

The process consists, essentially, of the following steps when applied to relatively small sections of eutectoid steel:

1. Heating above the critical range to render it austenitic.
2. Quenching into a hot quenching bath maintained at some predetermined temperature below the critical range but above 350° F.
3. Holding at this temperature for a predetermined time to insure complete direct transformation of the austenite to the final product.
4. Cooling to room temperature by any convenient means.

Mr. Legge distributed pamphlets describing the process in detail. He also had many samples of treated material for examination. The most impressive of these was a small piece of 1.00% carbon steel wire 0.103 in. in diameter, which had been austempered to a Rockwell hardness of C-58 to 59. Mr. Legge demonstrated that this material could be bent nearly 180°.

The speaker discussed some of the limitations of the process. It is not suitable for treating some alloy steels, due to the long transformation time at a given temperature. The sections must be thin enough so that they will cool to the temperature of the liquid bath before any of the austenite can transform; hence, it can only be used on parts not exceeding  $\frac{1}{8}$  to  $\frac{1}{4}$  in. for plain carbon steel. Small amounts of alloys, which reasonably retard transformation, allow thicker sections, up to  $\frac{1}{2}$  to  $\frac{3}{4}$  in. thick.

## Importance of Welding Metallurgy Is Impressed

By Charles H. Jennings

Pittsburgh Chapter opened its fall season on Sept. 8 with a dinner and a lecture on "Welding Metallurgy" by J. C. Hodge, chief metallurgist, Babcock and Wilcox Co.

Dr. Hodge's lecture dealt in a brief and interesting manner with the effect of welding on the metallurgical structure of different carbon and alloy steels. The effect of the heat of welding on the structure of the metal adjacent to the weld was likened to that produced by simple heat treating processes.

The importance to the engineer of a thorough knowledge of welding metallurgy was impressed upon the members by the wide variety of products that have been welded from special alloys. Many of these alloys are of such a composition that they are only welded successfully by employing special procedures.

## Minutes of Meeting of Board of Trustees

(Continued from page 4)

would be available for distribution March 1 and that it would be exchanged free of charge to all members in good standing.

Some conversation was held with reference to other sources selling the National Metals Handbook at a lower rate than the price for which it might be obtained from the A.S.M., and it was the consensus that the price of the Handbook to junior members, members of the Society and to others should be an established uniform amount.

Mr. Anderson again brought up the matter of inviting chapter chairmen attending the national convention to breakfast some morning during the convention in order that they might have an opportunity to meet with the Board of Trustees and also have a gathering of mutual interests.

Mr. Anderson was selected as a committee of one to draw up rules and regulations for an informal meeting with the chairmen of the chapters in attendance at the Chicago convention.

Upon motion properly made, seconded and carried, S. L. Hoyt was extended an invitation to present the Campbell Memorial Lecture in 1940 (E. S. Davenport is Campbell lecturer for 1939).

A Chicago convention committee was appointed as follows: Arthur Clarage, chairman; R. G. Guthrie, R. S. Archer, H. A. Anderson, W. E. Remmers, H. S. Van Vleet, and K. H. Hobbie.

A recommendation of the Secretary to proceed with the publication of the five-year index of the volumes of TRANSACTIONS and METAL PROGRESS was approved. The index is to be sold to members at a pre-publication price of \$1.00 (regular price \$3.00).

The Board approved the establishment of a price of \$1.00 on the bound index already published for the first 15 years of TRANSACTIONS as long as the present supply lasts.

### Employment Service Enlarged

The Secretary was authorized to investigate further the establishment of additional employment service adaptable to the use of the Society and A.S.M. members and was given power to act in the establishment of this new service.

A suggestion had been presented that the Society publish a national membership directory and was given thorough and serious consideration by the Trustees. Because of the unusual makeup of the Society and since a membership directory would become a disadvantage to the members' present source of income from advertising, and

be of real value to such a small percentage of the membership, it was deemed inadvisable to publish such a directory.

It was decided that any chapter may once a year have the privilege of requesting a visit of a national officer located in proximity to that chapter to attend a meeting of the local executive committee at the expense of the Society. An officer or trustee attending such a meeting is to prepare a written report of the topics discussed and file it in the national office, where this report in turn is to be sent to the other members of the Board of Trustees.

It was determined that as an experiment the cost of binding a volume of TRANSACTIONS should be reduced from \$2.00 to \$1.00.

A suggestion was made that the price of books sponsored by the Society should be reduced to members, but it was agreed that because of the pre-publication prices offered members, the sale of books to chapters for educational work at 40% off, the sale of additional copies of the Handbook at half-price and other reduced items, this suggestion was well covered.

The request to underwrite publication of special papers presented at local chapter meetings was given consideration but it was the unanimous feeling of the trustees that THE REVIEW, TRANSACTIONS and METAL PROGRESS offer at the present time suitable means for the dissemination of metallurgical information so it should not be necessary to make any additional provisions, and that material worthy of being preserved can find an avenue of expression in one of the publication units now possessed by the members.

It was agreed that at the Chicago convention an experiment should be tried of having two round tables upon interesting, controversial subjects at which no stenographic record should be made to hamper free expression of thought.

Upon the suggestion that practical lecturers should be maintained similar to the late Mr. Keller, it was brought out that the Society now has in preparation moving pictures dealing with metallurgical subjects, lectures upon "borderline" topics, and eight educational courses with slides for use by the chapters. Many practical lectures are available by selecting different chapters of the educational courses now on hand and accompanied by slides, for presentation by a local speaker.

Upon motion properly made, seconded and unanimously carried the meeting adjourned.

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## Spring Coiler

Sleeper & Hartley's new segment type spring coiler speaks for itself in a new bulletin. Thirteen points of superiority are carefully explained and illustrated. Complete specifications are given. Bulletin R-189.

## Cerromatrix

Cerromatrix is an alloy of bismuth, lead, tin and antimony used for the mounting of dies and punches. A most attractive and instructive 23-page booklet describes in detail its properties, methods of use, and applications. Excellent illustrations. Cerro de Pasco Copper Corp. Bulletin R-190.

## Welding and Cutting Equipment

A catalog of 32 profusely illustrated pages depicts hand welding and cutting torches and tips, pressure regulators, fluxes, rods and other supplies, marketed by Air Reduction Sales Co. Eight complete outfits covering the entire range of industrial uses are shown. Bulletin R-191.

## EPI Microscope

The Zeiss EPI microscope for the illumination and observation of opaque material has unlimited applications for observing opaque material in dark field, bright field, and polarized light. A descriptive leaflet is published by Carl Zeiss, Inc. Bulletin Aa-28.

## Bright Annealing

Various types of electric and fuel-fired furnaces built by the Electric Furnace Co. for bright-annealing wire, tubing, strip and other products are described in a new 8-page folder. Bulletin Lb-30.

## Cr-Ni Alloy Castings

Calite Chromium-Nickel Alloy Castings for Annealing Furnace Bases are described in a new bulletin just released by the Calorizing Company. Illustrates typical installations and points out working advantages. Bulletin Lb-26.

## Gas Carburizing

A proven Muffleless Gas Carburizing Furnace with Continental Hypercarb Process for Hardening Steel is thoroughly described in a colorful 4-page booklet issued by Continental Industrial Engineers, Inc. Bulletin Lb-154.

## Microtomes

Bausch & Lomb Microtomes and Accessories are described and pictured in a 16-page booklet just issued by that company. Shows a wide range of instruments and explains their uses. Bulletin Lb-35.

## Aluminum

Data on all the properties and commercial forms of aluminum are contained in a new booklet just released by the Aluminum Company of America. Explains best alloy for each purpose. Bulletin Lb-54.

## Stressproof

A new Cold Finished Bar is introduced in a colorful booklet just released by the LaSalle Steel Company. Well illustrated, the booklet also contains tables showing substantial savings made by the use of this new steel. Bulletin Lb-52.

## Lubrication Improvements

Intensive research which completed important improvements in the field of heavy-duty gear and bearing lubrication is tabulated in a new 12-page illustrated bulletin just released by D. A. Stuart Oil Co., Ltd. Bulletin Lb-118.

## Electric Furnaces

Electric Furnaces suitable for light production, experimental and research purposes over a wide range of temperatures and operating requirements are described in a booklet just printed by C. I. Hayes, Inc. Bulletin Lb-15.

## Specialized Tester

The Rockwell superficial hardness tester is a specialized instrument for use where the indentation into the work must be kept shallow or of small area, yet sensitivity preserved. A supplement to Wilson Mechanical Instrument Co.'s catalog on the regular Rockwell tester tells all about it. Bulletin Sy-22.

## Galvanized Sheets

A unique answer to the question "Why Should I Use Republic Galvanized Sheets?" is contained in an interesting folder just released by the Republic Steel Corporation. Points out advantages and shows typical installations. Bulletin Lb-8.

## Which Grain Size

A very illuminating paper "Which Grain Size?" appeared in the March 1937 Transactions of the A.S.M. A reprint of this article is made available by the Bethlehem Steel Company. Bulletin Lb-76.

## Char-Mo Atmosphere

A colorful folder explaining how molybdenum steel can be heat treated without decarburization is now available through the Surface Combustion Corporation. Points out advantages of the new Char-Mo furnace and explains its operation. Bulletin Lb-51.

## Alloy Sling Chain

An illustrated bulletin explaining the advantages of the remarkable new nickel-molybdenum alloy used in high strength, heavy duty, heat treated alloy sling chains has been released by Joseph T. Ryerson & Son, Inc. Bulletin Lb-106.

## Wetting Agents

The American Cyanamid & Chemical Corp. has just issued a 32-page booklet which describes the Aerosol Wetting Agents, new synthetic chemicals possessing remarkable wetting, penetrating, emulsifying and dispersing properties. Bulletin Fb-148.

## Globar Elements

Globar Pin Type Non-Metallic Electric Heating Elements and Terminal Rods and Globar "AT" Type Non-Metallic Electric Heating Elements are explained and illustrated in two recent booklets issued by the Globar Division of the Carborundum Company. Bulletin Lb-25.

## Lectromelt Furnaces

The story behind lectromelt furnaces is well told in this 48-page booklet issued by the Pittsburgh Lectromelt Furnace Corporation. Tells of development of this type furnace and describes recent improvements. Bulletin Db-18.

## Wire Belts

An 8-page folder on Monel metal woven wire conveyor belts lists the advantages of Monel metal, illustrates some typical installations, and describes the various belt constructions that are available. Cambridge Wire Cloth Co. Bulletin Bb-178.

## Metals for Corrosion

Fourteen varieties of Midvaloy corrosion and heat resisting metals are described in a detailed bulletin by The Midvale Co. Properties and applications are listed and illustrated. Bulletin Ca-160.

## Tool Steels

Three little folders concisely describe three types of SKF tool steels, give their uses and recommendations for heat treatment. They are a carbon tool steel, an oil hardening steel, and a high alloy general purpose tool steel. Bulletin Ox-78.

## Arc Welders

New and improved General Electric Arc Welders are shown in a recently issued 16-page booklet made available by the General Electric Company. Well illustrated with photographs and interesting tables. Bulletin Lb-60.

## Heat Treat Chart

Heat treaters everywhere should find a heat treating wall chart complete with S.A.E. specifications a very valuable addition to their shops. Published by Chicago Flexible Shaft Co., manufacturers of Stewart industrial furnaces. Bulletin Ka-49.

## Ampeco Metal

The six grades of Ampeco metal, varying in hardness and largely responsible for all possessing wear resistance, tensile strength and corrosion resistance, are described in a booklet which also lists its uses in modern industry. Bulletin Ka-175.

## Nickel-Copper Steels

Exceptional resistance to corrosion and abrasion, increased tensile strength, and higher ductility are the qualities claimed for Youngstown Sheet & Tube Co.'s new series of Yolo steels. A summary of properties and notes on their characteristics are contained in Bulletin Ox-93.

## Laboratory Service

A new edition of "The Metal Analyst" tells about an organization established by Adolph I. Buehler specializing in the installation of metallurgical laboratories. The complete line of laboratory equipment marketed by Buehler is also catalogued. Bulletin Dy-135.

## Program Controller

Variable temperature control over any period of time can be automatically carried through to completion without supervision by means of a control just publicized by the Wheelco Instrument Company. Bulletin Kb-110.

## Magnet Steels

A very handsome booklet describes the permanent magnet steels and castings made by Simonds Saw & Steel Co., including Alnico and Alnic. Bulletin Ba-158.

## Tool Steel Selector

A wall chart, 30 x 20 in., to be used as a means for selecting the proper type of tool steel is offered by Carpenter Steel Co. to tool steel users in the U.S.A. only. Bulletin Jz-12.

## Welded Design

"How to Change Over to Welded Design for Profits" is the title of a 32-page profusely illustrated bulletin by Lincoln Electric Co., which is intended as an aid in applying electric welding to the design of machines and machinery structures. Bulletin Ab-10.

## Die Blocks

A handy, small size spiral-bound leather notebook is a complete handbook on Heppenstall Company's die blocks. Valuable additional data are contained, as well as a few blank pages for memoranda. Bulletin Ca-122.

## Vapocarb-Hump

Vapocarb-Hump, the triple-control method for heat treatment of steel, is described in a 36-page catalog issued by Leeds & Northrup Co., in which a special effort has been made to show how this method gives complete control of tool surface, shape and structure. Bulletin Cb-46.

## Carbonate Remover

A material for use in removal of carbonate from plating solutions is described in a new Electroplating Service Bulletin issued by Grasselli Chemicals Department of E. I. du Pont de Nemours & Co. Bulletin Bb-95.

## Air Draw Furnace

Hevi-Duty Electric Co. offers a folder on their box type air draw furnaces for tempering, drawing, preheating, or annealing. Two types are available, one for temperatures up to 750° F., and one for 1250° F. Bulletin Nv-44.

## Moly in Steel

Metallurgists, engineers and production executives who are really interested in the metallurgy of steels and their application will want the newly published book on molybdenum steels which has just been released by Climax Molybdenum Company. Bound in loose-leaf manner, this reference book is chock-full of tables which form a volume almost an inch thick. Bulletin Hb-4.

## Recuperators

Results obtained with Carborundum Company's recuperators using Carboflex tubes are fuel savings, closer temperature control, faster heating, and improved furnace atmosphere. Complete engineering data are given in Bulletin Fx-57.

## Seamless Tubes

Just prepared by the Timken Steel and Tube Division of Timken Roller Bearing Co. is "Guide for Users of High Temperature Steels," which presents technical data relating to the various properties of Timken seamless tubes. Bulletin Bb-71.

## Pure Metals

Pure, carbide-free metals are described and applications suggested in a pamphlet published by Metal & Thermit Corp., who make pure tungsten, chromium and manganese in addition to the ferro-alloys. Bulletin Ma-64.

## Chromel

A new catalog has been issued by Hoskins Mfg. Co. covering Hoskins electric furnaces and Chromel elements, which provide uniform heat and automatic temperature control with excellent production and quality of work. Bulletin Jz-24.

## Salt Bath

"Heating from the inside out" is what makes the Ajax-Hulgen salt bath furnace practical. Ajax Electric Co. explains this new operating principle in an interesting folder. Bulletin Oy-43.

## Mo-W High Speed

J. V. Emmons, metallurgist for Cleveland Twist Drill Co. and largely responsible for the development of the molybdenum-tungsten high speed steels known as Mo-Max, has prepared a general description of these new steels. Bulletin Ka-103.

## Panphot Microscope

A universal microscope with photomicrographic reflex camera is explained in this well-illustrated booklet by E. Leitz, Inc. Points out applications and advantages of this system. Bulletin Db-47.

## Duronze

An 80-page technical handbook covering the physical properties and applications of four high strength silicon bronzes pioneered by Bridgeport and sold under the trade name "Duronze alloys" has been released by the Bridgeport Brass Co. Bulletin Bb-163.

## Centricast Boxes

The story of centrifugally cast carburizing and annealing boxes—their reasons for being, method of production, properties, and advantages—is made extremely readable in a folder by Michigan Steel Casting Co. Bulletin Jy-84.

## Abrasive Cleaning

Comprehensive information on airless abrasive metal cleaning is contained in a new book on the "Wheelabrator" Tum-Blast, a patented mechanical device made by the American Foundry Equipment Co. Bulletin Fa-112.

## X-Ray Examination

The application of X-ray examination and inspection of castings, welding, and food products, as well as practical X-ray crystal analysis, is completely described and strikingly illustrated in General Electric X-Ray Corp.'s new 34-page publication. Bulletin Dy-6.

## Meehanite

A compact but complete specification chart gives the recommended grades of Meehanite metal for various service requirements. Complete physical properties and applications are included. Bulletin Da-165.

## Defi Rust

Analysis and descriptive notes of nine types of heat and corrosion resisting steels made by Rustless Iron and Steel Co. are contained in a handsome folder. Bulletin Ha-169.

## Rotoblast

A new blast cleaning machine eliminates the need for compressed air as the abrasive driving agent. Pangborn Corporation tells how a rapidly spinning wheel propels the abrasive by controlled centrifugal force. Bulletin Ox-44.

## Tempering Furnace

Technical details and operating data on Lindberg Steel Treating Co.'s new Cyclone electric tempering furnace, which has shown a remarkable performance record in steel treating operations, are given in Bulletin Fx-66.

## Hardness Testers

A handy thing to have around for anyone who does much hardness testing is a complete and detailed catalog of the universal line of hardness testers carried by Pyro-Electro Instrument Co., together with information on various specialized pieces of auxiliary equipment. Bulletin Fb-197.

## Stainless Data Book

All users of stainless and heat resisting alloys should find invaluable the information contained in a booklet published by Murrill, Inc., giving complete analyses of the alloys produced by the different manufacturers, along with the proper electrodes for welding each of them. Bulletin Jy-125.

## Heroult Furnace

Revised and expanded to include modern major innovations in the construction and operation of the Heroult electric furnace, a new edition of the American Bridge Co.'s Heroult Electric Furnace Bulletin is now ready for distribution. Bulletin Bb-124.

## Scleroscopes

Shore Instrument & Mfg. Co. describes its Model D standard recording scleroscope in a recent bulletin which explains the theory and practice of hardness testing with this machine. Bulletin S-33.

## Heat Resisting Alloys

Authoritative information on alloy castings, especially the chromium-nickel and straight chromium alloys manufactured by General Alloys Co. to resist corrosion and high temperatures, is contained in Bulletin D-17.

## Ni-Cr Castings

Compositions, properties, and uses of the high nickel-chromium castings made by The Electro Alloys Co. for heat, corrosion and abrasion resistance are concisely stated in a handy illustrated booklet. Bulletin Fx-32.

## Ingot Production

"The Ingot Phase of Steel Production" is the title of a book defining the principles of quality ingot production followed by many well-known steel manufacturers. Gathmann Engineering Co. Bulletin Ka-13.

## Nichrome Containers

The important part that containers play in economical and dependable carburizing is well known to metallurgists and heat treaters. Driver-Harris Co. bulletin on Nichrome carburizing containers should therefore not be neglected. Bulletin Ca-19.

## Gas Boosters

Spencer Turbine Co. has published for the first time information concerning Spencer gas boosters which have been in successful operation in many plants for several years. They are now standardized for handling all kinds of acid fumes, poisonous, corrosive or explosive gases. Bulletin Na-70.

## Bessemer Steel

Jones & Laughlin Steel Corp. has for distribution reprints of the paper by C. C. Henning on "Manufacture and Properties of Bessemer Steel" that received the Robert W. Hunt Award of the A.I.M.E. during 1935. Bulletin Ca-50.

## Oven Furnaces

In a nutshell American Gas Furnace Co.'s improved oven furnaces offer controlled atmosphere, quiet operation, economy, are over and under-fired and bottom vented. Described more fully in Bulletin Aa-11.

## Cutting Steel

Recommended practices for gas cutting of structural steel are given in a concise and authoritative form by the Linde Air Products Co. Qualification tests for good workmanship from the standpoint of accuracy and smoothness of cuts are also described. Bulletin Dc-43.

## Cr-Ni-Mo Steels

A Finkl & Sons' new catalog is really a technical treatise on chromium-nickel-molybdenum steels for forgings. Pocket size, 100 pages, cloth bound, illustrated by photographs, charts and tables. Bulletin La-23.

## Electroplating

A complete group of chemicals, processes and materials of interest to those engaged in electroplating is listed in this 8-page booklet published by the E. I. du Pont de Nemours & Co., Inc. Bulletin Eb-29.

## Alloy Castings

The "extra point" value of Michiana alloy castings is shown in a new booklet just released by the Michiana Products Corp. Typical installations are shown. Bulletin Nb-81.

## Steel Protection

Attractively printed in copper and black, a new booklet on U. S. S. Copper Steel "A Little Copper in Steel Gives a Lot of Protection" has been published by the United States Steel Corp. Subs. Bulletin Nb-79.

## Rust Preventive

How to prevent rust effectively is related in a bulletin issued by the Alox Corporation. Describes their method which is being used successfully in a wide variety of forms. Bulletin Nb-212.

## Six Metals

"Six Minutes with Six Metals" is the interesting title of a well illustrated booklet which describes various metals produced by the International Nickel Co. Bulletin Nb-45.

## The Review

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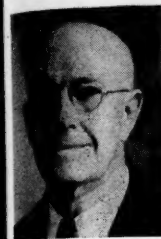
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## Here and There With A.S.M. Members

ON Sept. 14, 1892, JESSE M. DARKE entered the employ of General Electric Co. at the Lynn Works. There he organized a materials testing laboratory. This year, after nearly 46 years as director of this laboratory, Mr. Darke has retired on a pension.



J. M. Darke

In those days little was known about metals and alloys, and the laboratory was a very small department. Under Mr. Darke's direction, however, it grew rapidly and now tests all raw material for both physical and chemical properties, tests all fabricated materials, controls all processes in the plant such as heat treating and plating, and has charge of maintaining accuracy of all electrical measurements in the plant. Among Mr. Darke's early accomplishments were the operation of a crucible furnace to melt various high speed steels, pioneer work in gear and pinion manufacture, and early heat treating developments.

Mr. Darke is a past chairman of the Boston Chapter A.S.M., a charter member of the American Foundrymen's Association, active in A.S.T.M. committee work, and a member of the American Chemical Society.

RECENTLY promoted to district manager in New England for Wheelock, Lovejoy & Co., Inc., is ARDEN L. KNIGHT, vice-chairman of the Boston Chapter.

Mr. Knight has been in the metallurgical and sales departments at the home office for the past 12 years and has a wide acquaintance in the machine tool and textile machinery industries of New England. He previously did sales and contact work for several years in the Cleveland and Detroit offices.

ROBERT W. WILSON, patent attorney, has opened an office of his own in Cleveland and has closed his association with Fay, Oberlin & Fay.

Mr. Wilson has been in patent work for 18 years, 5 as an examiner in the Patent Office and 13 as a practicing attorney. He has been in Cleveland since 1928. Much of his work has been concerned with foundry equipment, forging machinery and industrial ovens.

APPOINTMENT of D. J. RICHARDS, past chairman, Pittsburgh Chapter, as manager of steel mills sales is announced by E. F. Houghton & Co. Mr. Richards was a divisional sales manager for this company and will retain his headquarters in Pittsburgh.

Mr. Richards has had more than 20 years' experience as a supplier to the steel industry while with E. F. Houghton & Co., and prior to that time spent a number of years in steel mill service. He is a graduate in mechanical engineering and metallurgy at the University of Pittsburgh.

SELECTED to deliver a course of lectures on "Recent Progress in the Metallurgy of Iron and Steel" at the plant of the Tata Iron and Steel Co. near Calcutta, India, is A.S.M. Past-President GEORGE B. WATERHOUSE, professor of metallurgy at Massachusetts

Institute of Technology. Dr. Waterhouse will sail on Dec. 21 and return to New York on Feb. 23.

This series will form part of a lecture program to be given each year in honor of Charles P. Perin, the original engineer on the Tata plant, who acted as consulting engineer until his death about two years ago.

THOMAS G. HARVEY is now doing graduate work in metallurgy under Prof. J. F. Oesterle at the University of Wisconsin. Until November 1937 Mr. Harvey was metallurgist for Snap-On Tools Corp. in Kenosha, a position he left to accept a similar one with Edison General Electric Appliance Co. in Chicago. A few days after beginning this he was seriously injured in an automobile accident in Chicago.

## Greene Describes Method Of Determining Furnace Atmosphere for Tool Steel

By A. F. Holden

New Haven Chapter—Subject of the Nov. 17th meeting, "Hardening of Tool Steels," although an old and oft repeated one, was of great interest, as evidenced by an attendance of close to 150. Speaker of the evening was O. V. Greene, metallurgist for the Carpenter Steel Co.

Mr. Greene presented some slides showing, among other things, the rate of heating of various types of steels and also the method of determining the furnace atmosphere, particularly the percentage of oxygen, by the use of hard wood or wood of low volatile content. Thus it is possible, by noting the rapidity with which the wood ignites, to determine the relative amount of oxygen up to about 6%. Beyond this amount, say from 8 to 10% oxygen, testing is done with a gas torch.

Mr. Greene brought out another point—that all the various types of steel have the same rate of heating up to 1650° F. This statement seemed to be contrary to commonly held notions and some members took exception to this observation claiming that their experience showed otherwise.

In concluding, Mr. Greene stressed the importance of maintaining an active or live atmosphere in contrast to a stagnant one. He recommended flues even with electric muffle furnaces, in

## Cold Cylinder Type Die Casting Machine Favored by Colwell

Recounts Early Difficulties in Developing Zinc Die Castings

By George E. Stoll

Notre Dame Chapter—The first portion of the November meeting was a very interesting motion picture entitled "Manufacture of Safety Glass."

The speaker of the evening was D. L. Colwell, sales manager of the Stewart Die Casting Corp. His subject was "The Production and Application of Die Castings."

Die castings as distinguished from permanent mold and other castings formed Mr. Colwell's introductory remarks. From this he moved into an explanation of the different types of machines which have been developed for the making of die castings. He favors the cold cylinder type machine for aluminum die castings because of the higher injection pressures possible.

A most interesting discussion of the historical metallurgy of zinc was next embarked upon by the speaker. Most of the metal difficulties encountered in the early days of zinc die castings were later remedied only through the use of zinc of extremely high purity.

Small percentages of impurities caused imperfections and failures in zinc die castings where aluminum was used as an alloying ingredient. This forced the use of aluminum, as an alloying element, to be discontinued until purer zinc was available.

For many years lead, tin and cadmium have been considered extremely detrimental impurities in zinc die casting alloys but recent tests have shown that cadmium is not as harmful as was originally supposed.

The speaker's discussion of aluminum die castings, based on his wide experience in the troubles encountered in making them, also was interesting and complete.

Slides were used by the speaker throughout his lecture and were very beneficial in providing a clearer conception of the data presented.

order to move and circulate the atmosphere and prevent dead spots in the chamber.

The spirited discussion following Mr. Greene's discourse was clear evidence that his talk was received with keen interest by the Chapter members.

## Chicago Puts Out S. R. O. Sign for Boegehold Lecture

By Alfred R. Conti

Chicago Chapter—A full house, even to standing room, met at the Medinah Club on Nov. 10 to hear A. L. Boegehold talk on "Some Unusual Aspects of Malleable Iron Melting."

This talk was based on his Campbell Memorial Lecture presented at the National Metal Congress, and J. F. Calef, technical chairman, summarized briefly why we have a Campbell Memorial Lecture, and explained who was picked each year to present it. After a brief summary of the lectures in the past he presented Mr. Boegehold.

Since the lecture is extensively summarized in the November issue of METAL PROGRESS, it will not be reviewed here.

After the lecture an all-color sound movie entitled "Steelmaking" was shown. It dealt with the ore from the mine to the finished bar and sheet.

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### Positions Wanted

ASSISTANT METALLURGIST: Aeronautical. Degree in chemistry; commercial and federal experience. Two years inspection control of plane and motor engineering materials. Five years metallurgical laboratory on chemical and physical testing, metallography, heat treatment of engineering steels, nitralloy, corrosion resistant steels. Aluminum foundry, Magnaflex, riveting, plating, welding, fuels and lubricants. Box 12-5.

FOUNDRY METALLURGIST or chemical analyst: Two years in chemical engineering at Purdue. Two years as chemist in analysis of different types of steels, gray irons and ferrous alloys used in truck manufacture; 2½ years in gray iron foundry on chemical analysis, making of mixtures, melting and testing to conform to A.S.T.M. and federal specifications. Age 26, Single. Box 12-10.

HEAT TREATING FOREMAN or SUPERINTENDENT: 20 years experience. Prefers industrial to commercial heat treating. References. Box 12-15.

ASSISTANT METALLURGIST: B. Met. E., M.Sc. Six years plant and laboratory experience in seamless steel tubing. Experience in routine analysis, physical testing, metallography and heat treatment. Four years non-technical office experience in a supervisory capacity. Desires investigation, business or production position in steel industry. Middle west preferred; salary of secondary importance. Age 36. Box 11-25.

SALES AND SERVICE ENGINEER: Metallurgical engineer, steel mill trained; 12 years experience in sales and practical service to steel mills and allied industries. Particularly successful in the introduction, sale and servicing of new products. Salary or contract basis. Box 8-15.

CHEMIST: Young man, technically trained, desires position in analytical laboratory or heat treating department. Four years experience in metallurgical and analytical laboratories both in ferrous and non-ferrous work. Single. Available immediately; location immaterial. Box 12-20.

METALLURGIST: Age 26, B.S. Penn State. Four years experience iron, steel, non-ferrous alloys, as observer, electric melting shop foreman, and metallurgist in production and laboratory work. Employed at present but desires position with future. Any location. Box 12-30.

EXPERIENCED FOUNDRYMAN: 31, single. Understands production and jobbing work on light, medium, and heavy castings, also cupola, electric furnace and converter practice, sands, metals, rigging, and gating. B.S. and M.S. in metallurgy from recognized school. Successful record both as metallurgist and superintendent, but will consider any foundry work. Willing to go anywhere. Best of references. Box 12-35.

METALLURGIST: Graduate, age 27, married. Experienced tool and die hardener, carbon and high speed steels; hardness testing equipment, chemical analysis, and metallography of steels. Familiar with gas and electric furnace operation and control. Now employed as metallurgist with small concern manufacturing cold headed products. Box 12-40.

METALLURGIST: B.S. in metallurgy, Queens University, 1922. Experience in open-hearth, metallurgical laboratory, metallography and physical testing, as contact metallurgist, in government ferrous work and in forge plant. Author of several published technical articles. Box 12-45.

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D. J. Richards



## British Developments Are Reviewed at Milwaukee Meeting

By F. D. Steinway

Milwaukee Chapter—At the October meeting J. W. Jenkin, director of research, Tube Investments, Ltd., Birmingham, England, provided a very illuminating talk on "A British View of Current Ferrous Developments." Dr. Jenkin was one of very few who were able to make the trip originally scheduled by the British Iron and Steel Institute and the Institute of Metals.

He gave a general talk on topics receiving attention in Great Britain, and touched on current views on creep, oxidation, austenitic steels, structural materials, non-destructive testing, grain size (which, he said, is not emphasized as much as it is in America), internal stress, hair-line cracks, and corrosion, and gave a general account of cooperative research on a national scale in Great Britain.

Dr. Jenkin described the work being carried out by the British Iron and Steel Industrial Research Council under the direction of its various committees, such as those devoted to blast furnaces, open-hearth practice, industrial furnaces, rolling mills, smoke abatement, corrosion, steel castings, heterogeneity of ingots, and alloy steels.

While this work is small in volume compared with the more directly applied research in industrial laboratories, it has nevertheless resulted in the building up of valuable nationwide effort over the last 14 years.

The speaker answered a number of subsequent questions on the interpretation of high temperature data, on specifications and inspection, and on corrosion testing.

The coffee talk was presented by Dr. Stewart Scrimshaw, professor of industrial relations, Marquette University. He spoke on the "European Dilemma" and correlated current European events with the history of the various countries involved.

## Bonds for Abrasives Are of Five Types

(Continued from page 1)

rubber, for thin wheels, and high speed cutting.

Grain size and grain arrangement are of great importance. In order to grind a high tensile steel it is necessary to have a high tensile wheel. The density of a wheel often determines its success.

For coated abrasives the same materials are used except that they are applied to a flat surface. The backing must be strong, flexible, and have good wearing qualities. Old manila rope makes a most desirable backing.

The latest development is electro coating of abrasive papers by means of kenitron tube using a high electrostatic field.

The advantages of this method are that the particles are all standing on end and are in a geometrical arrangement on the paper due to the electro forces exerted on each particle as it approaches the backing. The phenomenon was demonstrated by a 10,000-volt model of an electro-coating device. The theory behind all abrasives, as

## Metallurgical Problems in Metal Coating Discussed

By G. E. Healy

Oregon Chapter—At the meeting on Nov. 17 Chairman Ulrich read a letter from the secretary of the Puget Sound Chapter at Seattle suggesting a joint meeting at some place midway between the two cities later in the spring. The secretary was instructed to write to Seattle expressing our willingness to cooperate in such a meeting.

The speaker of the evening, Gordon L. von Planck, was introduced by Norton L. Peck. Mr. von Planck gave a very interesting talk on metallurgical problems in the coating of metals with zinc, tin and enamel.

He told of the effect of lead on the cutting properties of steel and how it was discovered. He gave a definition of "killed steel," "rimmed steel," and "capped steel" and described the production and use of each.

explained by Mr. Wiswell, is that as they are used, the particles break off and present new cutting faces. If the wheels are properly designed and used, they will have enough voids to prevent them from becoming clogged.

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## CHAPTER CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Baltimore	Jan. 16	Engineers Club	Howes Bodfish	Aluminum Alloys
Boston	Jan. 6	Room 6-120, M.I.T.	P. B. Greenwald	A Review of Developments of Stainless Steel
Buffalo	Jan. 12	Hotel Buffalo	J. R. Townsend	Fatigue and Its Relation to Mechanical and Metallurgical Properties of Metals
Calumet	Jan. 10	Woodmar Country Club, Hammond, Ind.	H. J. French	Age Hardening
Canton-Mass.	Jan. 12		Charles Hardy	Powder Metallurgy
Chicago	Jan. 12	Medinah Club	W. P. Woodside	A Panorama of Alloys in Steel
Cincinnati	Jan. 19	Hotel Alms	W. P. Woodside	A Panorama of Alloys in Steel
Cleveland	Jan. 9	Cleveland Club	W. L. Merrill	Cold Forging
Columbus	Jan. 10	Battelle Memorial Institute	B. K. Gonser	Furnace Atmospheres
Dayton	Jan. 11	Engineers Club	B. K. Gonser	Furnace Atmospheres
Detroit	Jan. 9	Fort Shelby Hotel	Roy Cowen	Superficial Hardening
Hartford	Jan. 10	Hartford Gas Co.	Russell M. Franks	Corrosion Resisting Steels
Indianapolis	Jan. 16		Reinhold Schempp	Grain Size
Lehigh Valley	Jan. 6	Hotel Traylor, Allentown, Pa.	C. C. Nitchie	Spectrographic Analysis
Los Angeles	Jan. 12	Barker Bros.	G. M. Cunningham and G. L. Knox	Geophysical Exploration of Oil Structures
Mahoning Val.	Jan. 10	Tod Hotel	Sam Tour	Die Casting
Milwaukee	Jan. 10	Milwaukee Athletic Club	W. P. Woodside	A Panorama of Alloys in Steel
Montreal	Jan. 9		W. A. Mudge	High Nickel Alloys
New Haven	Jan. 19	University Club, Bridgeport, Conn.	E. L. Bartholomew	Interrupted Quenching of Cast Iron
New Jersey	Jan. 16	Essex House, Newark	Charles E. Pack	Die Castings
New York	Jan. 9		J. J. Crowe	Flame Machining, Flame Hardening and Flame Softening
North West	Jan. 9	Minnesota Union, U. of Minn.	W. P. Woodside	A Panorama of Alloys in Steel
Notre Dame	Jan. 11	Engineering Auditorium, Univ. of Notre Dame	W. P. Woodside	A Panorama of Alloys in Steel
Ontario	Jan. 6	Hamilton	H. C. Bigge	Basic Arc Electric Furnace Melting
Oregon	Jan. 13	Lloyds Golf Club	George M. Huck	Selection and Application of Alloy Steels
Philadelphia	Jan. 6	Engineers Club	R. Sergeson	Metallurgical Services From the Standpoint of the Supplier
Philadelphia	Jan. 27	Engineers Club	R. B. Sosman	Pyrometric Control in Metallurgical Production
Pittsburgh	Jan. 12	Roosevelt Hotel	K. C. McCutcheon	Open-Hearth Practice With Respect to Rimming Steel
Puget Sound	Jan. 4	Engineers Club, Seattle, Wash.	L. T. Holt	Principles of Metallography
Rochester	Jan. 9	Rochester Chamber of Commerce	H. W. McQuaid	Selection of Steels and Their Proper Heat Treatment
Rockford	Jan. 13	Elks Club	W. P. Woodside	A Panorama of Alloys in Steel
Saginaw Valley	Jan. 17	Bancroft Hotel, Saginaw, Mich.	Carl A. Harmon	Cast Iron
Schenectady	Jan. 17	Van Curler Hotel	Samuel Epstein	Grain Size and Abnormality of Steel
Springfield	Jan. 16	Hotel Worthy, Springfield, Mass.	Burns George	Tool Steels and Their Applications
St. Louis	Jan. 20	York Hotel		Leaded Steels
Syracuse	Jan. 10		C. H. Bierbaum	Brass and Bronze Alloys
Texas	Jan. 23			National Officers Night
Toledo	Jan. 23	University Club	Roy Cowen	Modern Pearlitic Malleable Iron
Tri-City	Jan. 10			Party Night
Washington	Jan. 9	Garden House, Dodge Hotel	J. S. Vanick	Modern Cast Iron
Worcester	Jan. 11	Sanford Riley Hall, Worcester Polytech. Inst.	A. D. Bach	Commercial Heat Treating